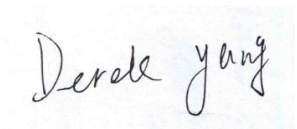
FCCTEST REPORT

Application No:	ZR/2019/90020
Applicant:	Qualcomm Atheros, Inc.
Address of Applicant	1700 Technology Drive, San Jose, CA 95110
Manufacturer:	Qualcomm Atheros, Inc.
Address of Manufacturer:	1700 Technology Drive, San Jose, CA 95110
EUT Description:	2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module
Model No.:	QCNFA324
Trade Mark:	Qualcomm
FCC ID:	PPD-QCNFA324
Standards:	47 CFR FCC Part 2, Subpart J 47 CFR Part 15, Subpart C
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10 (2013)
Date of Receipt:	2019/11/30
Date of Test:	2019/12/1 to 2019/12/16
Date of Issue:	2021/5/11
Test Result:	**PASS ***

.* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Derek Yang
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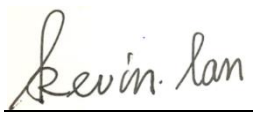
1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00		2019/12/16		Original
01		2020/1/6		Modified limit for Unwanted Emissions in the Restricted Bands (Radiated)
02		2020/1/8		Updated the peak power
03		2021/5/11	Kevin.Lan	1.Add test site Information 2.Modify data conversion error of antenna height 3.Update equipment list

*This report supersedes our previous report ZR/2019/9002001, issued on 2020/1/8, which is hereby deemed null and void.

Authorized for issue by:		
Prepared By		 **(Kevin.Lan) /Engineer**
Checked By		 **(David Chen) /Reviewer**

Remark:

This is to request a Class II permissive change for 2x2 802.11a/b/g/n/ac + Bluetooth Module, Model Name: QCNFA324, FCC ID: PPD-QCNFA324.

The major change filed under this application is:

• The subject approved module is being used in a specific host (portable category configuration, brand name/model: Lenovo/Lenovo CT-X636F).

• Power reduction in order to comply with SAR and RSE requirements.

So only conducted output power and unwanted emissions that fall Out of the Restricted Bands (Radiated), unwanted emissions in the Restricted Bands (Radiated) spot checked, and the data displayed in this report, other data can refer to the original report (Report No.: RF140808E04).

2 Test Summary

Test Item	Test Requirement	Test method	Test Result	Result	Test Lab*
Conducted Output Power	15.247 (b)(3)	ANSI C63.10 2013	Clause 4.1	PASS	A
Radiated Spurious Emissions	15.247(d); 15.205/15.209	ANSI C63.10 2013	Clause 4.2	PASS	B
Restricted bands around fundamental frequency (Radiated Emission)	15.247(d); 15.205/15.209	ANSI C63.10 2013	Clause 4.3	PASS	B

Remark：All test were performed by Lab A and B.

Parts of test items above were subcontracted to Lab B.

Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Lab B SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD.

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3 General Information

3.1 Client Information

Applicant:	Qualcomm Atheros, Inc.
Address of Applicant:	1700 Technology Drive, San Jose, CA 95110
Manufacturer:	Qualcomm Atheros, Inc.
Address of Manufacturer:	1700 Technology Drive, San Jose, CA 95110

3.2 Test Location

Lab A:

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code:	518057
Test Engineer	Adam Liang, Mike Hu

Lab B:

Company:	SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD.
Address:	1/F, Unit D, Building 1, Kanghong Orange Technology Park, No.137, Keyuan 3rd Road, Fengdong New City, Xi'an, Shaanxi China
Post code:	710086
Test Engineer	Ben Huang

3.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

Lab A:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

Lab B:

• A2LA (Certificate No. 4854.01)

SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4854.01.

• FCC –Designation Number: CN1271

3.4 General Description of EUT

EUT Description:		2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module
Model No.:		QCNFA324
Trade Mark:		Qualcomm
Product Description of Host		Portable Tablet Computer
Model No. of Host:		Lenovo CT-X636F
Trade Mark of Host:		Lenovo
Host	Hardware Version:	Google Chrome 79.0.3940.0 (Platform 12601.0.0-19.10.16)
	Software Version:	Lenovo Tablet CT-X636F
IEEE 802.11 WLAN Mode Supported		☒ 802.11B (20 MHz channel bandwidth), ☒ 802.11G (20 MHz channel bandwidth) ☒ 802.11N (20 MHz channel bandwidth), ☒ 802.11N (40 MHz channel bandwidth)
Operation Frequency:		2400 MHz -2483.5MHz fc = 2407 MHz + N * 5 MHz, where: -fc = “Operating Frequency” in MHz, -N = “Channel Number” with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth.
Type of Modulation:		IEEE for 802.11B: DSSS IEEE for 802.11G : OFDM IEEE for 802.11N(HT20) : OFDM IEEE for 802.11N(HT40) : OFDM
Sample Type:		☐ Portable Device, ☒Module
Antenna Type:		☐ External, ☒ Integrated
Antenna Ports:		☒ Ant 1, ☒Ant 2, ☐ Ant 3

Smart System:	☒ SISO (for 802.11B/G/N), ☒ MIMO (for 802.11N): 2 Tx &2 Rx, ☐ Diversity (for 802.11B/G) : Tx & Rx
Antenna Gain:	Ant1:-0.8dBi; Ant2:-0.9dBi
Power Supply:	☐ AC/DC Adapter; ☒ Battery ☐ PoE:; ☐ Other:

Operation Frequency of each channel (802.11B/G/N HT20)							
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Operation Frequency of each channel (802.11N HT40)						
Channel	Frequency	Channel	Frequency	Channel	Frequency	
3	2422MHz	6	2437MHz	9	2452MHz	
4	2427MHz	7	2442MHz			
5	2432MHz	8	2447MHz			

Remark:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency for 802.11B/G/N (HT20)	Frequency for 802.11N (HT40)
The Lowest channel	2412MHz	2422MHz
The Middle channel	2437MHz	2437MHz
The Highest channel	2462MHz	2452MHz

3.5 Test Environment and Mode

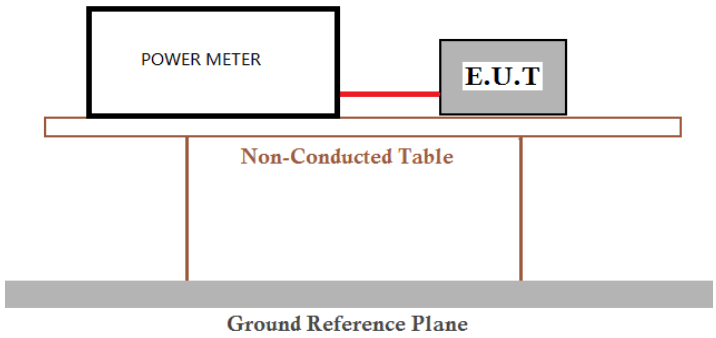
Operating Environment:	
Temperature:	25.0 °C
Humidity:	50 % RH
Atmospheric Pressure:	101.30KPa
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

3.6 Description of Support Units

The EUT has been tested independent unit.

4 Test results and Measurement Data

4.1 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section 11.9.1.3
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40).
Limit:	30dBm
Test Results:	Pass

4.1.1 Test Results

Measurement Data of Average Power:

Mode	Test Channel	Average Output Power (dBm)		Total Power (dBm)	Result
		ANT1	ANT2		
802.11B	Lowest	17.28	17.52	20.41	Pass
	Middle	17.58	17.79	20.70	Pass
	Highest	17.72	17.68	20.71	Pass
802.11G	Lowest	12.21	12.44	15.34	Pass
	Middle	17.66	17.89	20.79	Pass
	Highest	12.56	12.55	15.57	Pass
802.11N20	Lowest	11.94	12.28	15.12	Pass
	Middle	17.36	17.72	20.55	Pass
	Highest	12.17	11.89	15.04	Pass
802.11N40	Lowest	10.93	10.57	13.76	Pass
	Middle	13.08	13.26	16.18	Pass
	Highest	7.91	7.98	10.96	Pass

Measurement Data of Peak Power:

Mode	Test Channel	Peak Output Power (dBm)		Total Power (dBm)	Result
		ANT1	ANT2		
802.11B	Lowest	20.15	20.48	23.33	Pass
	Middle	20.70	20.54	23.63	Pass
	Highest	20.77	21.15	23.97	Pass
802.11G	Lowest	19.93	19.18	22.58	Pass
	Middle	23.72	23.91	26.83	Pass
	Highest	19.49	19.67	22.59	Pass
802.11N20	Lowest	19.12	18.98	22.06	Pass
	Middle	23.67	23.45	26.57	Pass
	Highest	18.75	18.78	21.78	Pass
802.11N40	Lowest	17.23	17.08	20.17	Pass
	Middle	18.85	18.96	21.92	Pass
	Highest	14.90	15.07	18.00	Pass

4.2 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 :2013 Section 11.12				
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

Test Setup:	

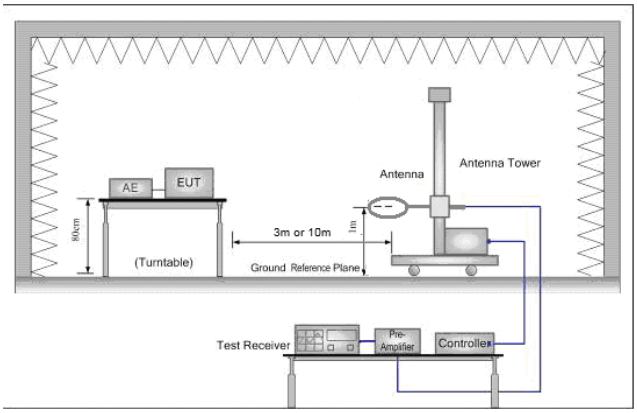


Figure 1. Below 30MHz

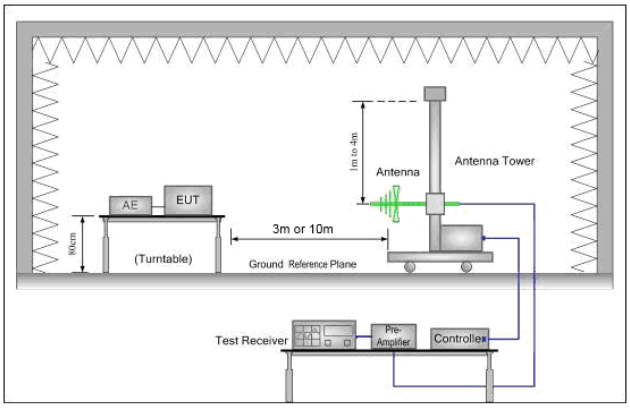


Figure 2. 30MHz to 1GHz

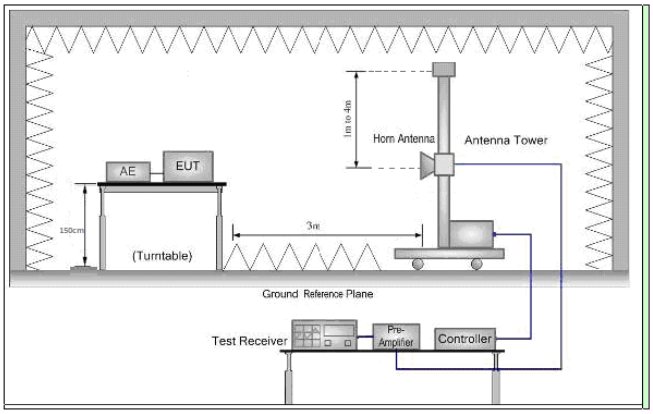


Figure 3. Above 1 GHz

Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the groundat a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees todetermine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the groundat a 3 meter semi-anechoic camber. The table was rotated 360 degrees todetermine the position of the highest radiation c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and thenthe antenna was tuned to heights from 1 meter to 4 meters(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatabletable was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and SpecifiedBandwidth with Maximum Hold Mode. g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be

	re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. h. Test the EUT in the lowest channel,the middle channel ,the Highest channel i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case. j. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge + Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40) For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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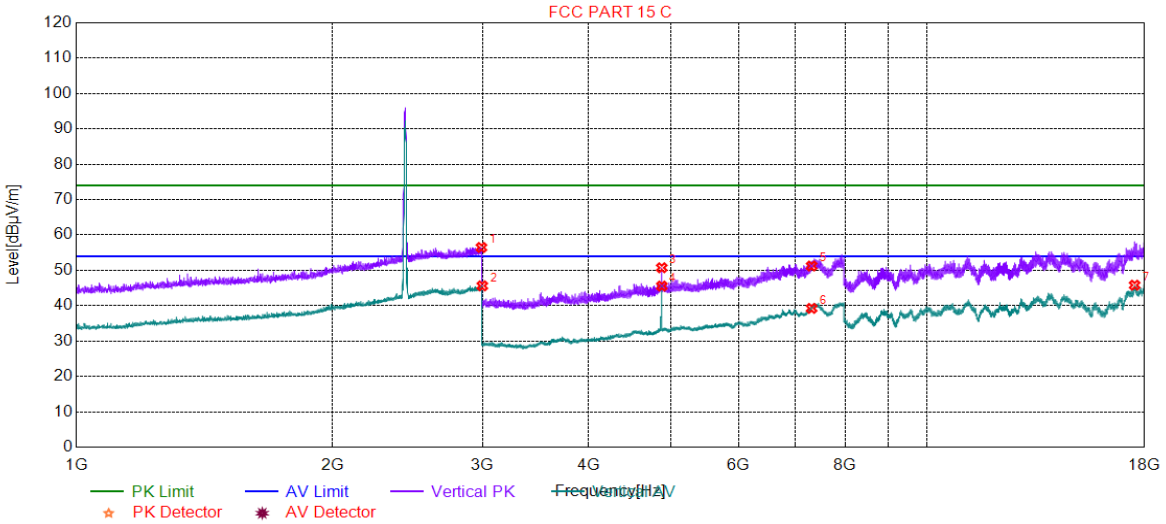
4.2.1 Transmitter emission above 1GHz

4.2.1.1.1 802.11B_ Middle Channel_ Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2992.4981	56.47	11.36	74.00	17.53	228	114	PK	Vertical
2	2998.9998	45.62	11.36	54.00	8.38	228	86	AV	Vertical
3	4873.6874	50.73	-14.68	74.00	23.27	259	0	PK	Vertical
4	4874.6875	45.57	-14.67	54.00	8.43	234	0	AV	Vertical
5	7311.0000	51.23	-6.24	74.00	22.77	284	151	PK	Vertical
6	7311.0000	39.25	-6.24	54.00	14.75	169	0	AV	Vertical
7	17519.4760	45.81	0.60	54.00	8.19	158	18	AV	Vertical

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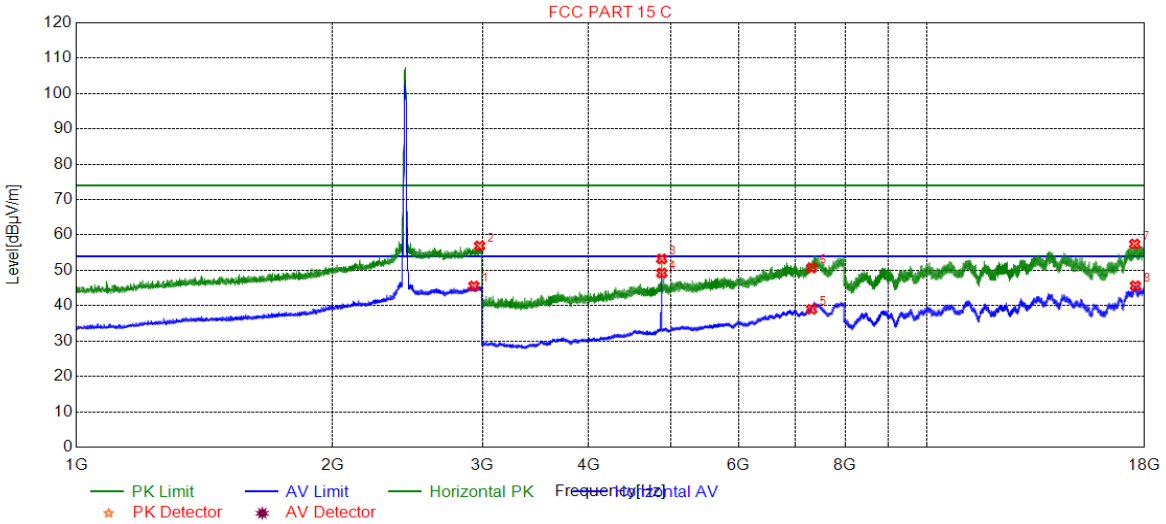
4.2.1.1.2 802.11B_ Middle Channel_ Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2931.9830	45.57	11.39	54.00	8.43	108	232	AV	Horizontal
2	2977.4944	56.91	11.37	74.00	17.09	138	39	PK	Horizontal
3	4873.6874	53.24	-14.68	74.00	20.76	154	70	PK	Horizontal
4	4874.6875	49.25	-14.67	54.00	4.75	228	97	AV	Horizontal
5	7311.0000	38.99	-6.24	54.00	15.01	143	15	AV	Horizontal
6	7311.0000	50.67	-6.24	74.00	23.33	140	288	PK	Horizontal
7	17524.4762	57.44	0.66	74.00	16.56	154	277	PK	Horizontal
8	17555.4778	45.63	1.06	54.00	8.37	216	68	AV	Horizontal

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3）As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

4）All Modes have been tested, but only the worst case data displayed in this report.

4.3 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013 Section 11.12		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

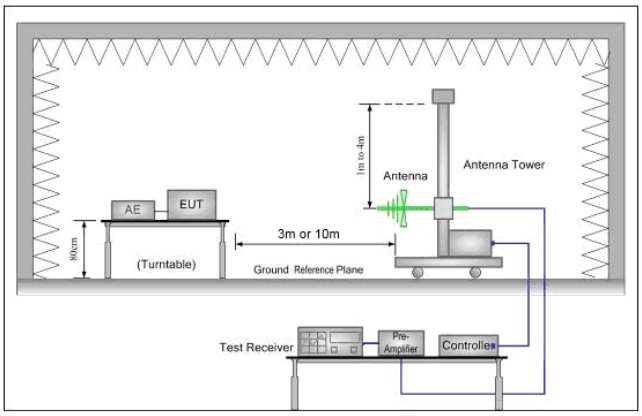


Figure 1. 30MHz to 1GHz

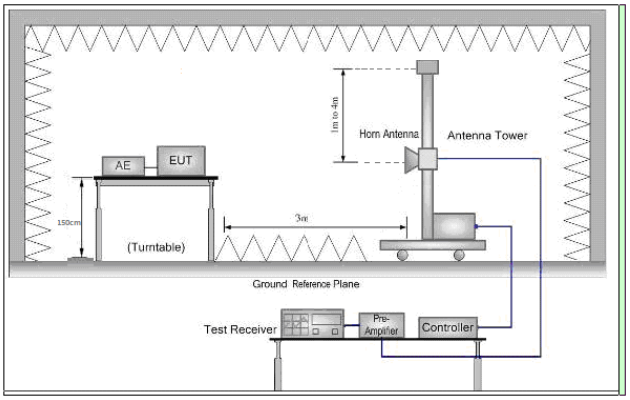
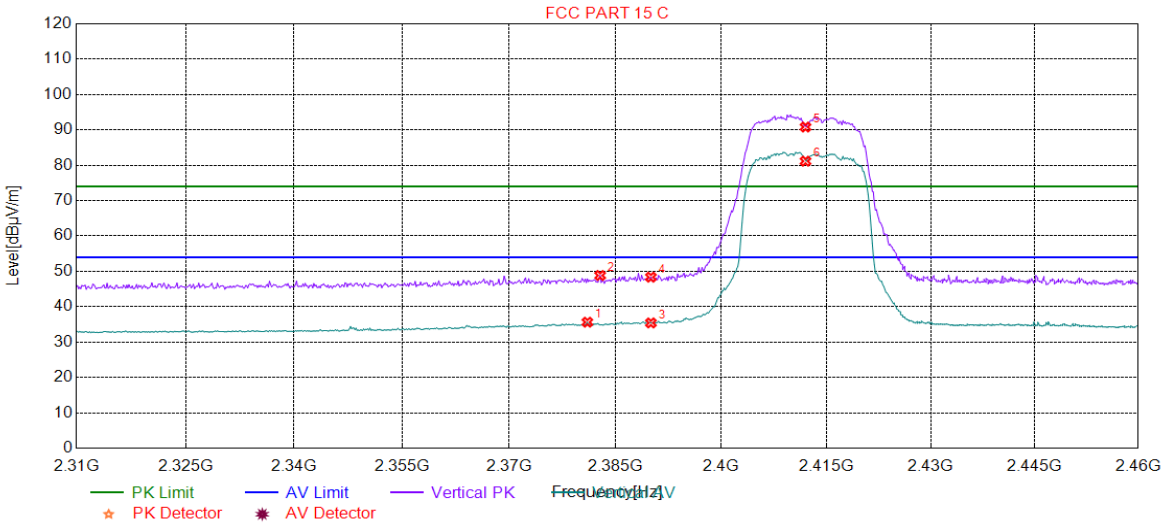


Figure 2. Above 1 GHz

Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the groundat a 3or 10 meter semi-anechoic camber. The table was rotated 360 degrees todetermine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the groundat a 3 meter semi-anechoic camber. The table was rotated 360 degrees todetermine the position of the highest radiation. c. The EUT was set 3or 10 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and thenthe antenna was tuned to heights from 1 meter to 4 meters and the rotatabletable was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and SpecifiedBandwidth with Maximum Hold Mode. g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel h. Test the EUT in the lowest channel , the Highest channel i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case. j. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge +Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40). Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

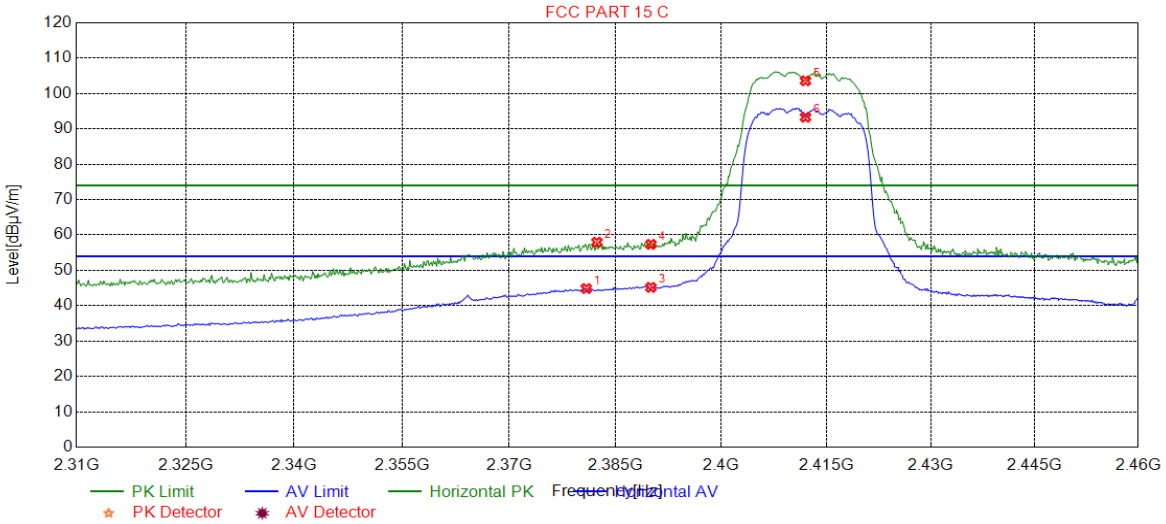
Test plot as follows:

4.3.1.1 802.11B_Lowest Channel_ Vertical



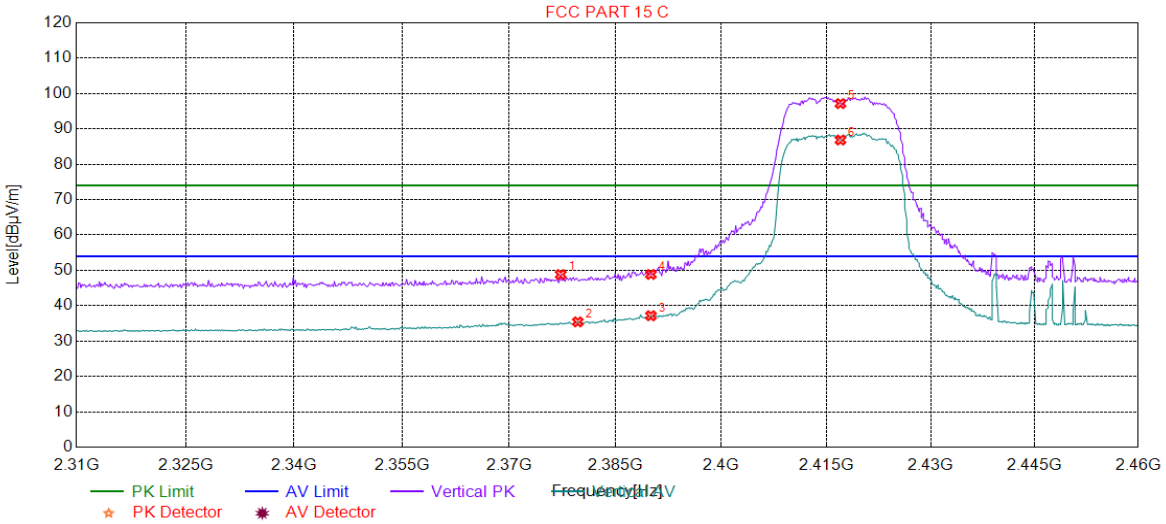
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2381.0210	35.63	9.17	54.00	18.37	276	292	AV	Vertical
2	2382.8228	48.84	9.17	74.00	25.16	241	246	PK	Vertical
3	2390.0000	35.42	9.20	54.00	18.58	232	333	AV	Vertical
4	2390.0000	48.36	9.20	74.00	25.64	289	342	PK	Vertical
5	2412.0000	90.80	9.27	---	---	150	225	PK	Vertical
6	2412.0000	81.15	9.27	---	---	150	304	AV	Vertical

4.3.1.2 802.11B_Lowest Channel_ Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2380.8709	44.86	9.17	54.00	9.14	217	318	AV	Horizontal
2	2382.3724	57.97	9.17	74.00	16.03	205	314	PK	Horizontal
3	2390.0000	45.19	9.20	54.00	8.81	228	322	AV	Horizontal
4	2390.0000	57.35	9.20	74.00	16.65	227	309	PK	Horizontal
5	2412.0000	103.60	9.27	---	---	185	322	PK	Horizontal
6	2412.0000	93.29	9.27	---	---	158	322	AV	Horizontal

4.3.1.3 802.11G_Lowest Channel_ Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2377.2673	48.81	9.15	74.00	25.19	202	41	PK	Vertical
2	2379.6697	35.43	9.16	54.00	18.57	277	90	AV	Vertical
3	2390.0000	37.17	9.20	54.00	16.83	164	86	AV	Vertical
4	2390.0000	48.85	9.20	74.00	25.15	255	118	PK	Vertical
5	2417.0000	97.15	9.28	---	---	181	70	PK	Vertical
6	2417.0000	86.86	9.28	---	---	202	70	AV	Vertical

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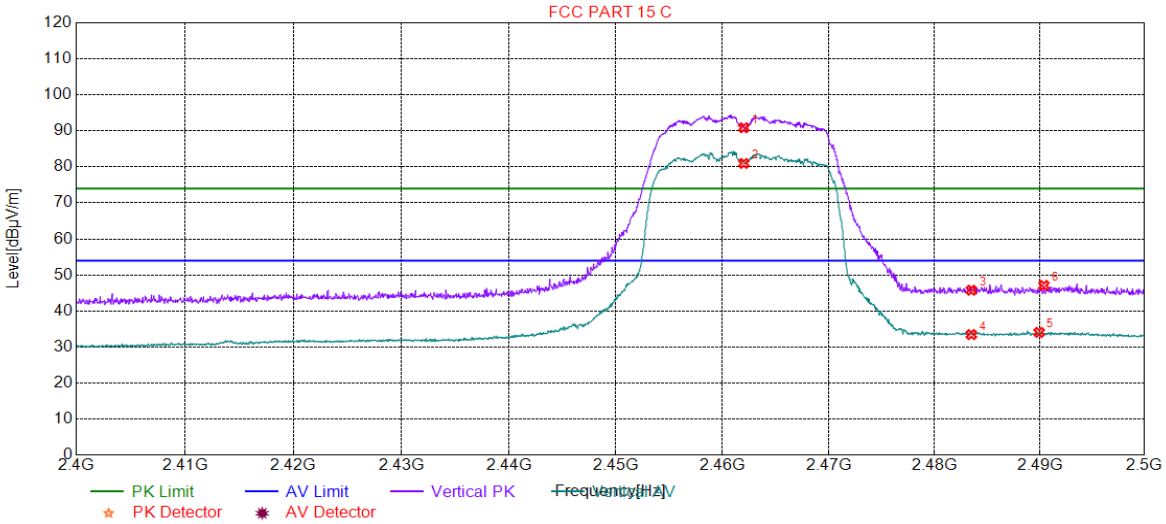
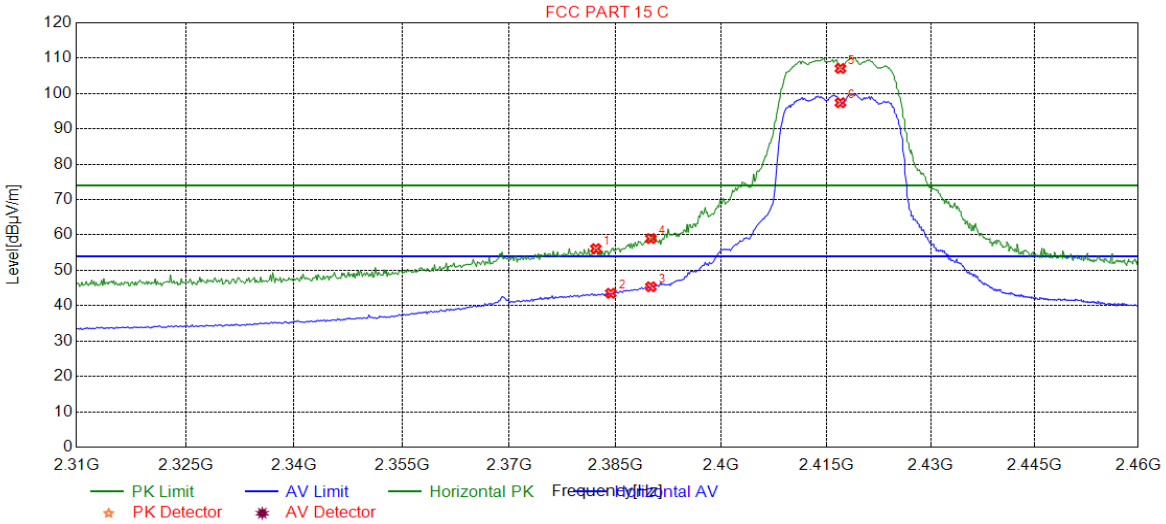
4.3.1.4 802.11G_ Highest Channel_ Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2462.0000	90.86	9.43	---	---	298	292	PK	Vertical
2	2462.0000	80.96	9.43	---	---	227	243	AV	Vertical
3	2483.5000	45.76	9.50	74.00	28.24	170	330	PK	Vertical
4	2483.5000	33.47	9.50	54.00	20.53	201	325	AV	Vertical
5	2489.9450	34.06	9.52	54.00	19.94	263	330	AV	Vertical
6	2490.3952	47.11	9.52	74.00	26.89	178	330	PK	Vertical

4.3.1.5 802.11G_Lowest Channel_ Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2382.2222	56.14	9.17	74.00	17.86	210	104	PK	Horizontal
2	2384.3243	43.52	9.18	54.00	10.48	205	108	AV	Horizontal
3	2390.0000	45.36	9.20	54.00	8.64	105	104	AV	Horizontal
4	2390.0000	59.00	9.20	74.00	15.00	162	104	PK	Horizontal
5	2417.0000	107.09	9.28	---	---	139	104	PK	Horizontal
6	2417.0000	97.40	9.28	---	---	108	112	AV	Horizontal

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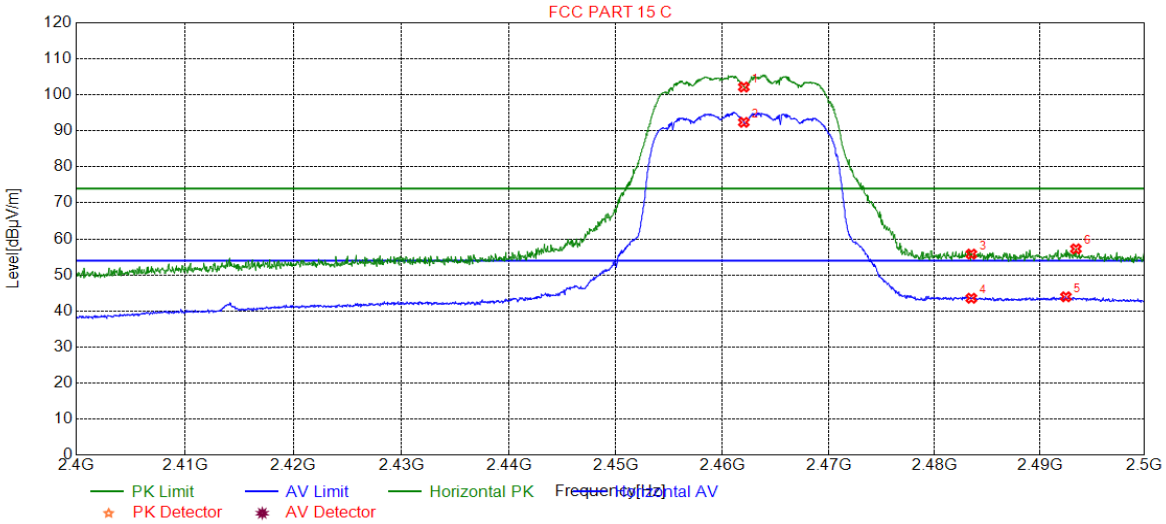
4.3.1.6 802.11G_ Highest Channel_ Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2462.0000	102.16	9.43	---	---	215	316	PK	Horizontal
2	2462.0000	92.37	9.43	---	---	223	316	AV	Horizontal
3	2483.5000	55.79	9.50	74.00	18.21	212	316	PK	Horizontal
4	2483.5000	43.54	9.50	54.00	10.46	114	316	AV	Horizontal
5	2492.4962	43.94	9.53	54.00	10.06	145	310	AV	Horizontal
6	2493.4467	57.24	9.53	74.00	16.76	242	288	PK	Horizontal

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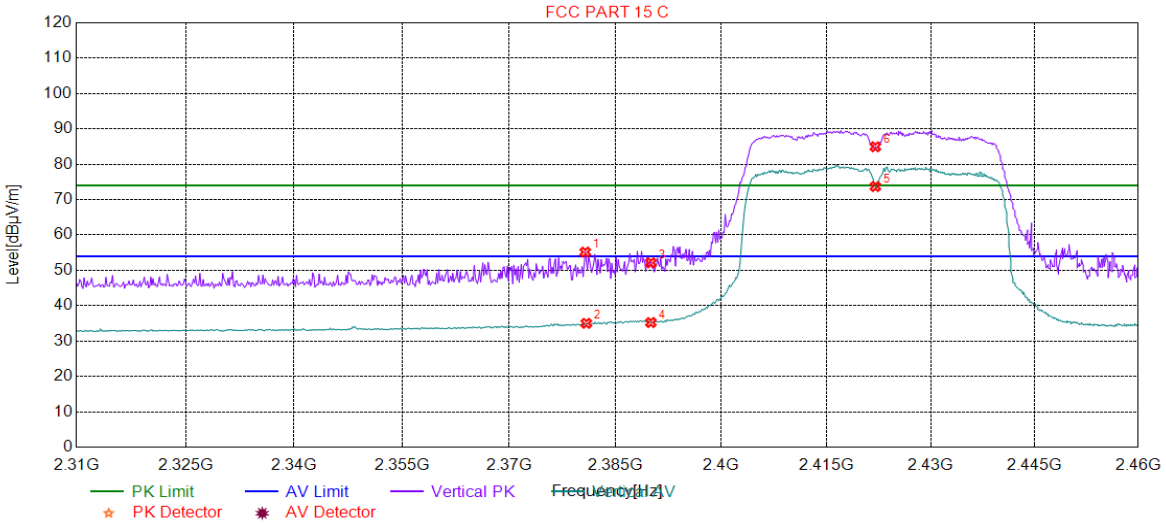
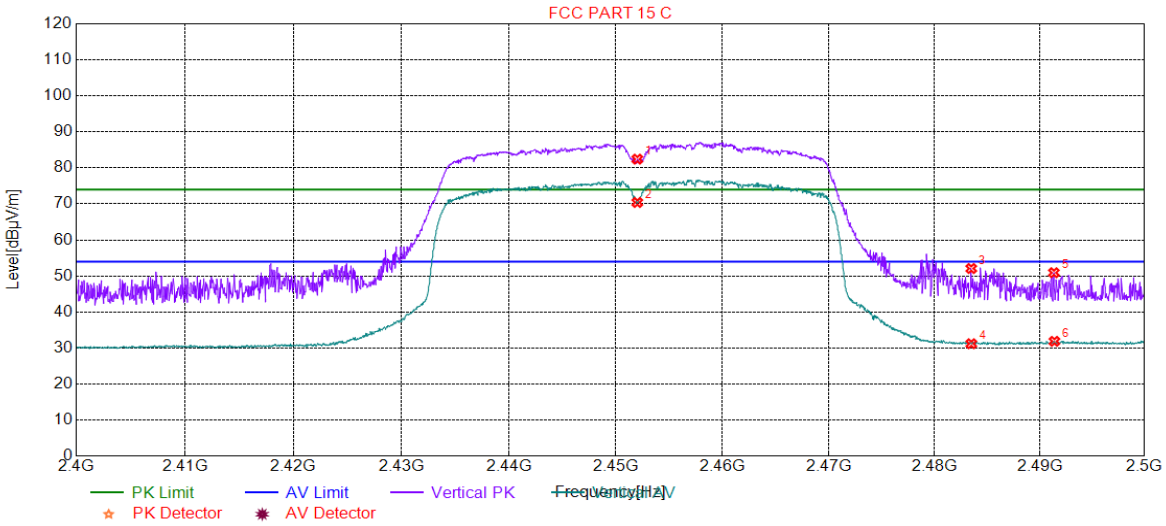
4.3.1.7 802.11N40_MIMO_Lowest Channel_ Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2380.7207	55.17	9.17	74.00	18.83	194	304	PK	Vertical
2	2380.8709	35.03	9.17	54.00	18.97	242	300	AV	Vertical
3	2390.0000	52.13	9.20	74.00	21.87	168	79	PK	Vertical
4	2390.0000	35.25	9.20	54.00	18.75	180	116	AV	Vertical
5	2422.0000	73.70	9.30	---	---	296	100	AV	Vertical
6	2422.0000	84.94	9.30	---	---	265	259	PK	Vertical

4.3.1.8 802.11N40_MIMO_ Highest Channel_ Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2452.0000	82.43	9.40	---	---	276	84	PK	Vertical
2	2452.0000	70.40	9.40	---	---	183	84	AV	Vertical
3	2483.4917	52.07	9.50	74.00	21.93	281	298	AV	Vertical
4	2483.5000	31.19	9.50	54.00	22.81	205	277	PK	Vertical
5	2491.3457	50.90	9.52	74.00	23.10	267	298	AV	Vertical
6	2491.3957	31.86	9.52	54.00	22.14	270	277	PK	Vertical

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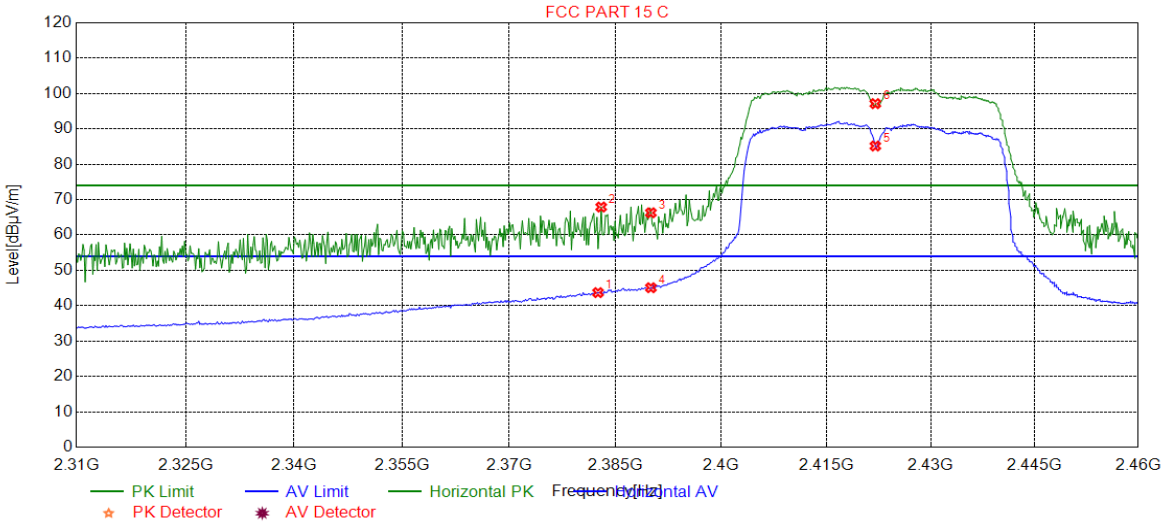
4.3.1.9 802.11N40_MIMO_Lowest Channel_ Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2382.5225	43.71	9.17	54.00	10.29	136	318	AV	Horizontal
2	2382.9730	67.91	9.17	74.00	6.09	173	318	PK	Horizontal
3	2390.0000	66.27	9.20	74.00	7.73	205	272	PK	Horizontal
4	2390.0000	45.09	9.20	54.00	8.91	123	318	AV	Horizontal
5	2422.0000	85.16	9.30	---	---	105	289	AV	Horizontal
6	2422.0000	97.14	9.30	---	---	154	305	PK	Horizontal

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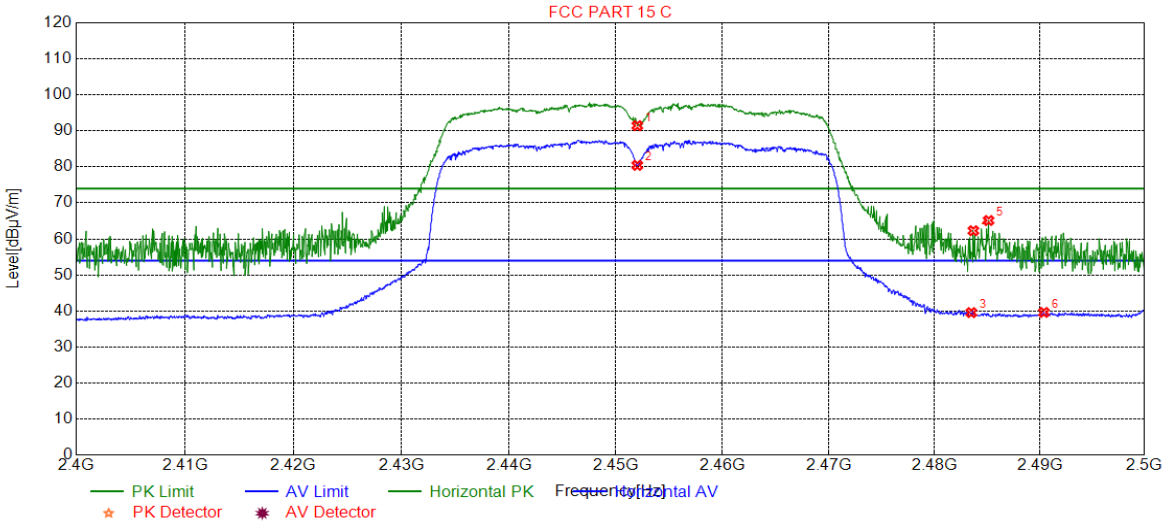
4.3.1.10 802.11N40_MIMO_ Highest Channel_ Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2452.0000	91.44	9.40	---	---	103	292	PK	Horizontal
2	2452.0000	80.43	9.40	---	---	152	298	AV	Horizontal
3	2483.5000	39.55	9.50	54.00	14.45	163	315	AV	Horizontal
4	2483.6918	62.28	9.50	74.00	11.72	218	320	PK	Horizontal
5	2485.1426	65.13	9.50	74.00	8.87	112	320	AV	Horizontal
6	2490.3952	39.61	9.52	54.00	14.39	171	315	PK	Horizontal

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

All Modes have been tested, but only the worst case data displayed in this report.

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5 Measurement Uncertainty (95% confidence levels, k=2)

Lab A:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.75dB
2	RF power density, conducted	±2.84dB
3	Spurious emissions, conducted	±0.75dB
4	Temperature test	±1°C
5	Humidity test	±3%
6	DC and low frequency voltages	±0.5%

Lab B:

No.	Item	Measurement Uncertainty
1	Conduction Emission	± 3.0dB (150kHz to 30MHz)
2	Radiated Emission	± 4.8dB (Below 1GHz)
		± 4.8dB (1GHz to 6GHz)
		± 4.5dB (6GHz to 18GHz)
		± 5.02dB (Above 18GHz)

6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2019/7/15	2020/7/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2019/1/13	2020/1/12
Coaxial Cable	SGS	N/A	SEM031-01	2019/6/12	2020/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019/7/14	2020/7/14
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2019/10/27	2020/10/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019/7/14	2020/7/14

CE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2019-09-07	2020-09-06
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2019-07-16	2020-07-15
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2018-12-16	2019-12-15
				2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ CE V2.5	XAW02-05-02	NCR	NCR

RSE Test System					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Semi-Anechoic Chamber	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
MXA signal analyzer	Keysight	N9020A	XAW01-06-01	2019-06-27	2020-06-26
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2019-09-07	2020-09-06
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2019-10-13	2021-10-12
Receiving antenna (1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2019-10-13	2021-10-12
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2019-10-13	2021-10-12
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR
Filter bank	Tonscend	JS0806s	XAW03-05-02	NCR	NCR
Amplifier	Tonscend	TAP00903040	XAW01-41-01	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2018-12-10	2019-12-09
				2019-12-03	2020-12-02
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2019-11-18	2020-11-17
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2018-12-16	2019-12-15
				2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ RSE V3.0.0.2	XAW02-05-01	NCR	NCR

7 Photographs - EUT Test Setup Details

Refer to Appendix A - Photographs of Set-Up for ZR/2019/90020.

The End